DP-304512

BATTERY TERMINAL AND METHOD FOR ITS INSTALLATION ON A BATTERY CASE

TECHNICAL FIELD

This invention relates to a battery terminal for an automotive type storage battery and a method for its installation on the battery case.

BACKGROUND OF THE INVENTION

Current automotive type storage batteries are equipped with a side terminal which is inserted into the battery case from the outside and includes a shoulder engaging the outer surface of the battery case. The portion of the terminal extending into the battery case is cold worked against the inner surface of the case by a spin riveting operation to form a back "button" where the leads of the battery plates are later welded to the terminal. The button is formed by slowly spinning the terminal down against the case, crimping the terminal against the plastic case and thus forming a tight seal and mechanical bond to the case. This method forms a seam within the terminal where it is rolled over to the inner surface of the case. This is not desirable, because the terminal is overstressed and creep occurs over time to weaken the crimp on the plastic. Furthermore, the seam that is formed within the terminal traps any battery acid that has seeped into it and then causes the terminal to corrode. This corrosion may cause the terminal to fail.

SUMMARY OF THE INVENTION

According to the present invention, the terminal is formed with a circumerentially extending shoulder which engages the inner surface of the battery case when the terminal is installed in the aperture in the case by inserting the terminal in the aperture from the inside of the battery case. A retaining ring is then interference resistance welded to the terminal as the retaining ring is pressed into a seated position against the outer surface of the

case. An o-ring seal on the shoulder engages the inner surface of the battery case and seals against leakage of the battery acid. High pressure deformation of the battery case and resulting creep are significantly reduced because the force that is used to press the retaining ring against the outer surface of the battery case is relatively low. Furthermore, the welded joint is almost as strong as the material that the terminal is made of and stronger than the plastic battery case.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a fragmentary cross-sectional view of a battery case and battery terminal made pursuant to the teachings of the present invention; and

FIGURES 2 - 5 illustrate the method steps required to install the battery terminal illustrated in FIGURE 1 into the battery case.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, a battery case generally indicated by the numeral 10 includes a side wall 12 which cooperates with other side walls and a bottom wall (not shown) to form a cavity into which plates are installed (after installation of the battery terminals as described herein) and welded to the battery terminals. The battery is filled with fluid and a top wall (not shown) is sealed to the side walls to complete the battery. Side wall 12 defines an inner surface 14, which faces into the battery case, an outer surface 16, which defines an exterior surface of the battery case, and a terminal aperture 18, which extends between the inner surface 14 and the outer surface 16.

A battery terminal 20 includes a barrel portion 22 which extends through the aperture 18. One end of the barrel portion 22 terminates in a projecting portion 24 which projects from a shoulder 26 which is substantially flush with outer surface 16 of the side wall 12 when the terminal 20 is installed in the aperture 18. The other end of the barrel portion 22

terminates in a circumferentially extending, radially outwardly projecting portion 28, which carries an o-ring seal 30 which circumscribes the aperture 18 and seals against the inner surface 14 of the side wall 12 when the barrel portion 22 is installed in the aperture 18, as will hereinafter be described. The o-ring seal 30 is accordingly effective in preventing leakage of battery acid through the aperture 18. A threaded insert 32 is molded within the terminal 20 and provides threads 34 for connection with a conventional battery cable when the battery is installed in an automotive vehicle.

The terminal is held in place by a circumferentially extending retaining ring 36 which terminates in a transverse surface 38 that is seated against the shoulder 26 and outer surface 16 of the side wall 12. The retaining ring 36 defines an inner circumferential surface 40 (FIGURE 2) that is dimensioned to receive outer circumferential surface 42 of projecting portion 24 with an interference fit. As will be hereinafter explained, the retaining ring 36 is seated with sufficient force to assure a leak-tight seal between the o-ring seal 30 and the inner surface 14, but insufficient to overstress the wall 12 and thus potentially causing subsequent creep which may be sufficient to cause leakage of battery acid.

Referring now to FIGURES 2-5, the method by which the terminal 20 is installed on the battery case 10 will be described. The barrel portion 22 of terminal 20 is installed in the aperture 18 from the inside of the battery case 10 and forced from the inner surface 14 toward the outer surface 16 until the 0-ring 30 is seated against the inner surface 14. As discussed above, the circumferential surfaces 40 and 42 are dimensioned such that the retaining ring 36 is received on projecting portion 24 with an interference fit. Accordingly, the retaining ring 36 is then forced onto the projecting portion 24 (see FIGURES 2 and 3) until retaining ring 36 attains an intermediate position illustrated in FIGURE 3, in which the transverse surface 38 remains displaced from shoulder 26 and the outer surface 16. The battery case 10 with the terminal 20 installed in aperture 18 and the retaining ring in the intermediate position illustrated in FIGURE 3 is then transferred to a bottom

electrode 44 of a conventional resistance welding machine generally indicated by the numeral 46 (FIGURE 4). The resistance welding machine 46 is conventional, and includes the lower electrode 44, an upper electrode 48, and a controller 50 which controls electrical current through the electrodes 44, 48. The upper electrode is advanced toward the lower electrode in a manner well known to those skilled in the art.

As the upper electrode 48 engages the retaining ring 36 in the intermediate position displaced from the fully seated position, an electrical current controlled by the controller 50 of a magnitude and cycle time readily available to those skilled in the art is caused to flow through the upper electrode 48, the retaining ring 36, the battery terminal 20, and the lower electrode 44. Current flow through the circumferentially extending surfaces 40, 42 causes both of these surfaces to soften, permitting the retaining ring 36 to be forced into the normal seated position illustrated in FIGURRE 1 in which the transverse surface 38 of the retaining ring 36 is seated against the shoulder 26 and outer surface 16 of the side wall 12 as the electrodes 44, 48 are brought into their fully closed position illustrated in FIGURE 5. As the retaining ring 36 is moved into the fully seated position, the softening of the interface between the retaining ring 36 and the terminal 22 causes these components to fuse together, provided a weld that is nearly as strong as the battery case 10 or the battery terminal 20 in themselves. Since the closing force of the electrodes is relatively low, deformation of the battery case and subsequent creep are significantly reduced as compared to prior art devices. Accordingly, sealing against acid leakage through the aperture 18 is improved. Furthermore, the crevices formed in the terminal by the prior art cold working operation, which tended to capture battery acid resulting in corrosion and eventual failure of the terminal, are eliminated.